

Method and system for converting a first light beam having a first frequency into a second light beam having a second frequency. A pump photon having (angular) frequency  $3\omega$  (or  $4\omega$ ) is provided within an optical cavity, defined by two mirrors that are fully reflecting at a frequency  $2\omega$ . In a first approach, the pump photon is received and down-converted ( $3\omega \rightarrow 2\omega + \omega$ ) by a first nonlinear crystal, and the  $2\omega$  photon is further down-converted ( $2\omega \rightarrow \omega + \omega$ ) by a second nonlinear crystal), to produce three photons ( $\omega + \omega + \omega$ ) that exit from the cavity. In a second approach, the pump photon is received and down-converted ( $4\omega \rightarrow 2\omega + 2\omega$ ) by a first nonlinear crystal, and one or both of the  $2\omega$  photons is further down-converted ( $2\omega \rightarrow \omega + \omega$ ) by a second nonlinear crystal).